



Reteaching

1.6 Scatter Plots and Lines of Best Fit

◆ Skill A Drawing a scatter plot and identifying any correlation

Recall A scatter plot is a graph of a set of ordered pairs in a coordinate plane. The ordered pairs represent data related to a pair of variables.

◆ Example

The information in the table shows the number of hours that cross-country runners practice per week versus their final placement in a race. Identify any correlation between the hours spent practicing and the final placement in a particular race.

Hours	3	4	5	7	8	9	10	11	12
Placement	45	34	30	20	15	17	10	9	3

◆ Solution

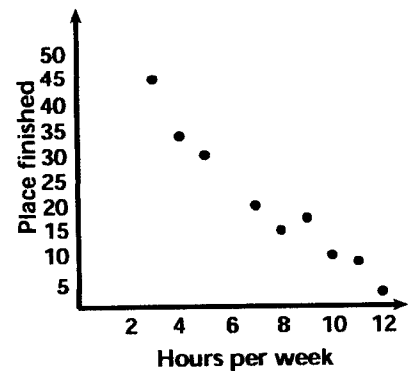
1. Draw a horizontal axis, label it "Hours per week." Draw a vertical axis, label it "Place finished." Add the appropriate numerical labels as shown at right.

2. Graph each ordered pair (hours, placement)

The table contains nine data pairs, so your scatter plot should contain nine points.

The complete scatter plot is shown at right.

Notice that the points seem to follow a down-and-to-the-right pattern, so there is a negative correlation between the variables.



Draw a scatter plot for each set of data. Identify the correlation, if any.

1.

Miles driven	200	320	260	300	654	155	190	75	180	135
Gallons used	7.0	14.5	12.0	9.0	9.0	2.5	6.8	4.0	6.2	5.0

2. number of miners working in a given year

Year	Number of workers
1860	25,300
1880	25,000
1900	20,300
1920	18,400
1940	15,000

3. hours per week that people of a certain age spent watching television

Age	Hours
13	16
19	12
15	12
13	18
16	21
12	19
17	14
16	14

Skill B Finding the line of best fit for a scatter plot

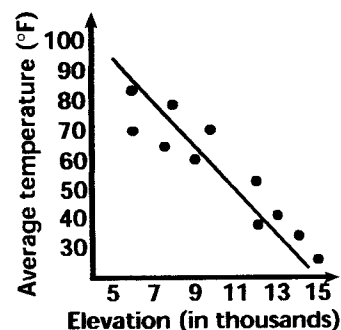
Recall The line of best fit represents an approximation of the data on a scatter plot.

Example

Approximate the line of best fit for the scatter plot.

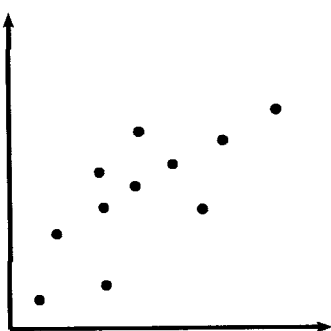
Solution

Use a straight edge and choose the line that is closest to all the points.

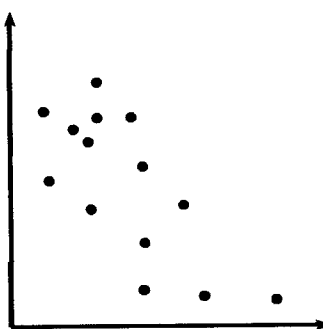


Approximate the line of best fit for each scatter plot.

4.

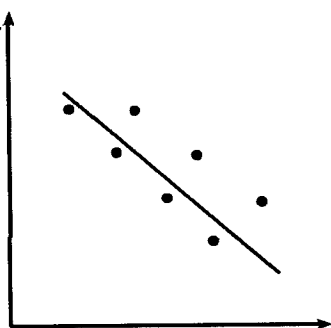


5.

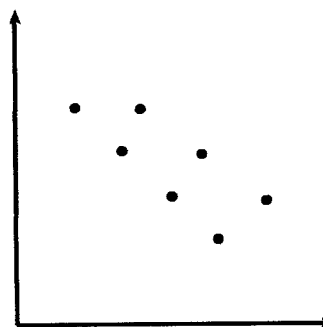
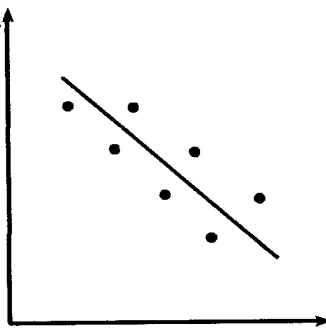


6. Which line below better represents the scatter plot at right?

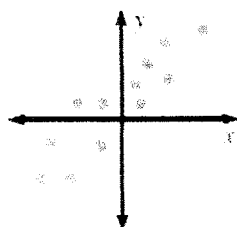
a.



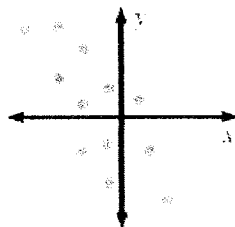
b.



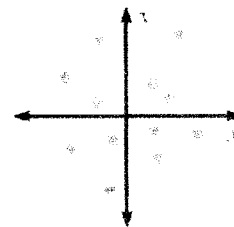
SCATTER PLOTS A **scatter plot** is a graph of a set of data pairs (x, y) . If y tends to increase as x increases, then the data have a **positive correlation**. If y tends to decrease as x increases, then the data have a **negative correlation**. If the points show no obvious pattern, then the data have **approximately no correlation**.



Positive
correlation

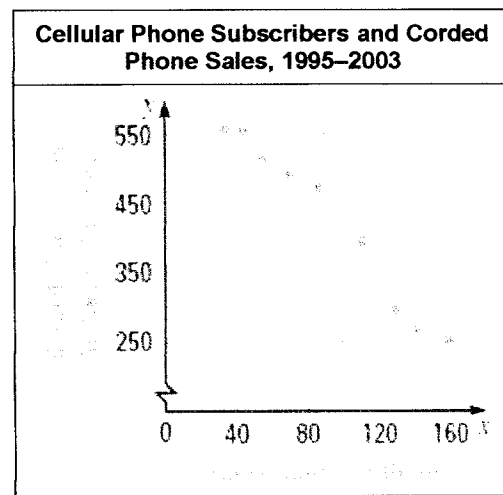
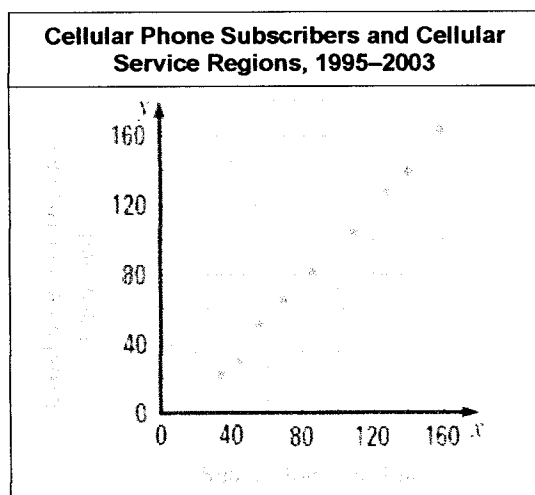


Negative
correlation



Approximately
no correlation

Example: **TELEPHONES** Describe the correlation shown by each scatter plot.



Solution:

CORRELATION COEFFICIENTS A **correlation coefficient**, denoted by r , is a number from -1 to 1 that measures how well a line fits a set of data pairs (x, y) . If r is near 1 , the points lie close to a line with positive slope. If r is near -1 , the points lie close to a line with negative slope. If r is near 0 , the points do not lie close to any line.

$$r = -1$$

Points lie near line
with a negative slope.

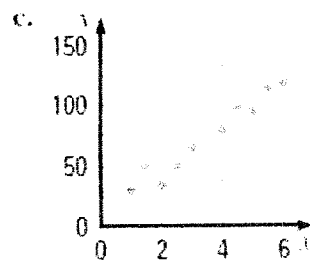
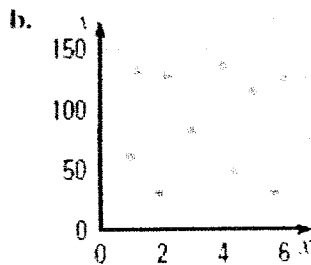
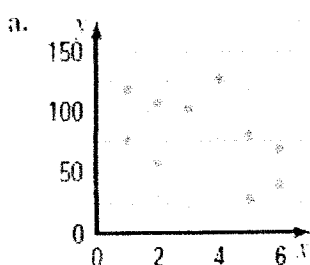
$$r = 0$$

Points do not lie
near any line.

$$r = 1$$

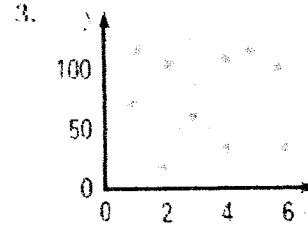
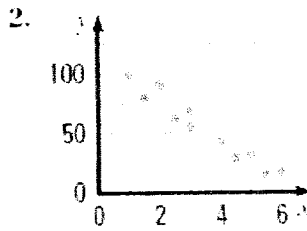
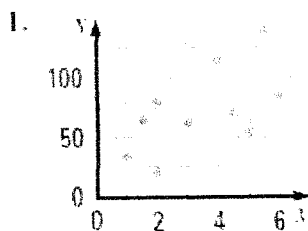
Points lie near line
with positive slope.

Example: Tell whether the correlation coefficient for the data is closest to -1, -0.5, 0, 0.5, or 1.



Solution:

Practice: For each scatter plot, (a) tell whether the data have a *positive correlation*, a *negative correlation*, or *approximately no correlation*, and (b) tell whether the correlation coefficient is closest to -1, -0.5, 0, 0.5, or 1.



BEST-FITTING LINES If the correlation coefficient for a set of data is near ± 1 , the data can be reasonably modeled by a line. The **best-fitting line** is the line that lies as close as possible to all the data points. You can approximate a best-fitting line by graphing.

Approximating a Best-Fitting Line

STEP 1 Draw a scatter plot of the data.

STEP 2 Sketch the line that appears to follow most closely the trend given by the data points. There should be about as many points above the line as below it.

STEP 3 Choose two points on the line, and estimate the coordinates of each point. These points do not have to be original data points.

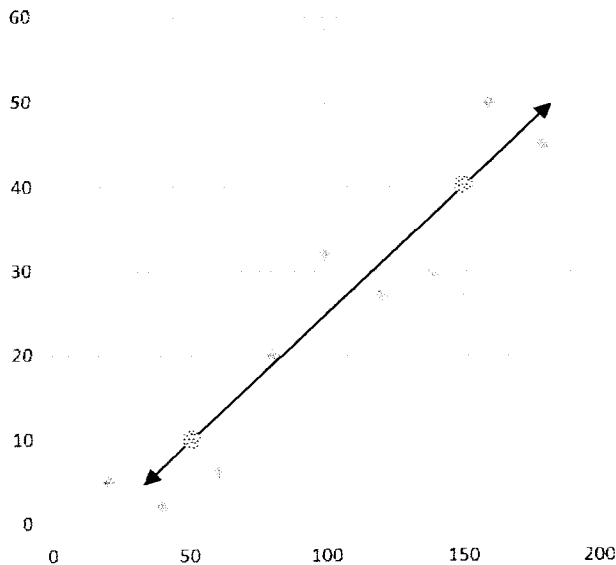
STEP 4 Write an equation of the line that passes through the two points from Step 3. This equation is a model for the data.

Name _____

Date _____

Scatter Plots of Linear Functions - Step-by-Step Lesson

What is the equation of the trend line shown?

**Explanation:**

A trend line roughly describes the relationship between two variables in a set of data. We can use a trend line to make predictions from a scatter plot.

Now we find the coordinates of the two points in green. Then we look at the two green points. Their coordinates are (50, 10) and (150, 40).

We will use the two points to find the slope.

Plug (50, 10) and (150, 40) into the slope formula.

$$m = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{40-10}{150-50}$$

$$m = \frac{30}{100} = \frac{3}{10}$$



Name _____

Date _____

The slope is $\frac{3}{10}$.

We use the slope and a point to find the y-intercept.

We will plug the slope $m = \frac{3}{10}$ and a point such as (50, 10) into the slope-intercept formula. Then we will solve for the y-intercept b.

$$Y = mx + b$$

$$10 = \frac{3}{10} (50) + b$$

$$10 = 15 + b$$

$$-5 = b$$

The y-intercept is -5.

Use the slope and the y-intercept to find the equation of the line.

Plug the slope $m = \frac{3}{10}$ and the y-intercept $b = -5$ into the slope-intercept formula.

$$Y = mx + b$$

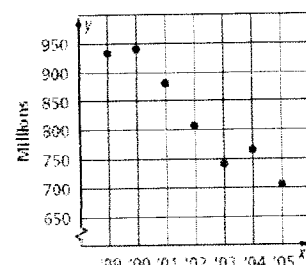
$$Y = \frac{3}{10} x - 5$$

The equation of the trend in slope-intercept form is $y = \frac{3}{10} x - 5$.



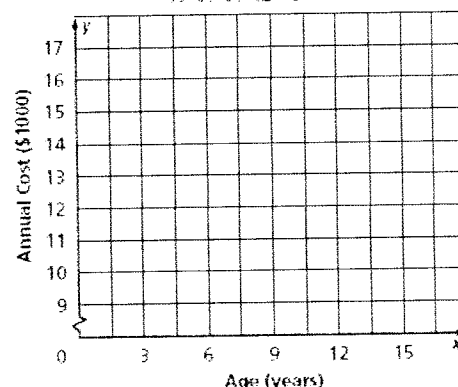
Scatter Plots and Lines of Best Fit Worksheet

1. **MUSIC** The scatter plot shows the number of CDs (in millions) that were sold from 1999 to 2005. If the trend continued, about how many CDs were sold in 2006?



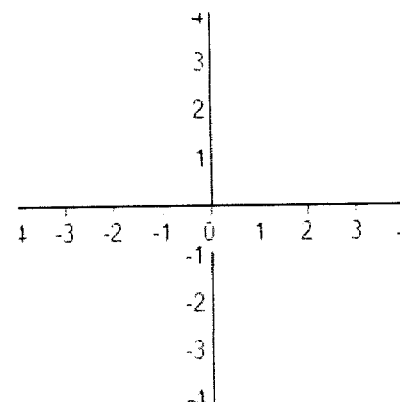
2. **FAMILY** The table below shows the predicted annual cost for a middle income family to raise a child from birth until adulthood. Draw a scatter plot and describe what relationship exists within the data.

Cost of Raising a Child Born in 2003					
Child's Age	3	6	9	12	15
Annual Cost (\$)	10,700	11,700	12,600	15,000	16,700



3. Make a scatter plot of the data in the table. Draw a line of best fit. What is the equation of the line of best fit?

X	-2	-2	-1	0	1	1	1	2	2	3
Y	2	3	2	1	0	1	-1	-1	-2	-2



4. **EDUCATION** The table at the right gives the number of hours spent studying for a science exam and the final exam grade.

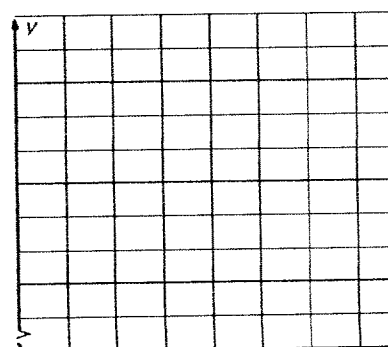
Study Hours	3	2	5	1	0	4	3
Grade	84	77	92	70	60	90	75

- a. Draw a scatter plot of the data and draw in the line of best fit.

- b. What is the equation for the line of best fit?

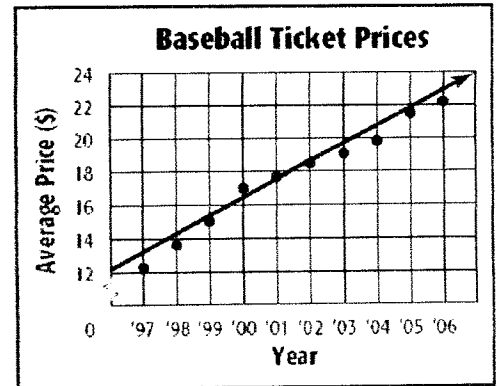
- c. Predict the grade for a student who studied for 6 hours.

- d. Could this line go on forever? Why or why not?



5. **BASEBALL** The scatter plot shows the average price of a major-league baseball ticket from 1997 to 2006.

a. Use the points (2001, 17.60) and (2002, 18.75) to write the slope-intercept form of equation for the line of fit shown in the scatter plot.



Source: Team Marketing Report, Chicago

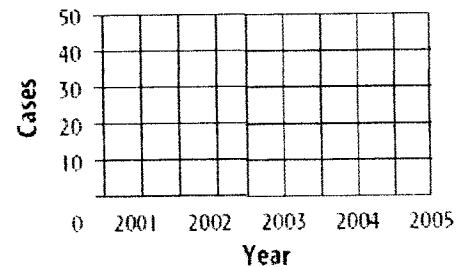
b. Use your equation to tell the price of a ticket in 2009. Is this extrapolation or interpolation?

6. **DISEASE** The table shows the number of cases of Foodborne Botulism in the United States for the years 2001 to 2005.

U.S. Foodborne Botulism Cases					
Year	2001	2002	2003	2004	2005
Cases	39	28	20	16	18

a. Draw a scatter plot and determine, what relationship, if any, exists in the data.

U.S. Foodborne Botulism Cases



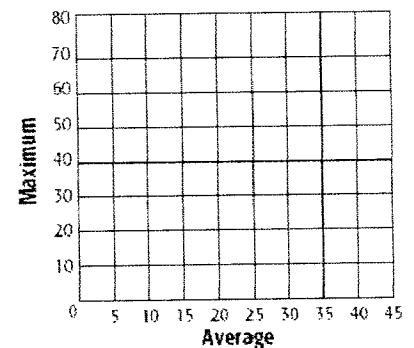
b. Draw a line of fit for the scatter plot, and write the slope-intercept form of an equation for the line of fit.

7. **ZOOS** The table shows the average and maximum longevity of various animals in captivity.

Longevity (years)								
Avg.	12	25	15	8	35	40	41	20
Max.	47	50	40	20	70	77	61	54

a. Draw a scatter plot and determine, what relationship, if any, exists in the data.

Animal Longevity (Years)



b. Draw a line of fit for the scatter plot, and write the slope-intercept form of an equation for the line of fit.

c. Predict the maximum longevity for an animal with an average longevity of 33 years. Is this an example of Extrapolation or Interpolation?



Reteaching

4.5 Graphing Data

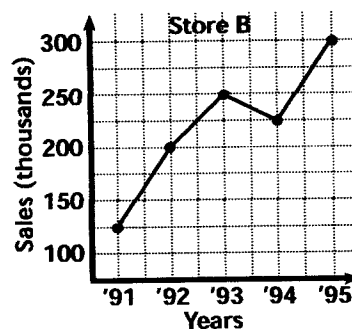
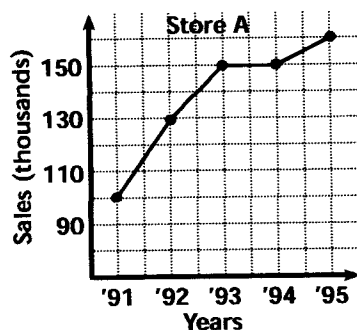
◆ Skill A Interpreting misleading line graphs

Recall Graphs are used to display data. The scales chosen for each axis are an important part of how the graph looks.

◆ Example

The graphs show sales for two ice-cream shops over 5 years.

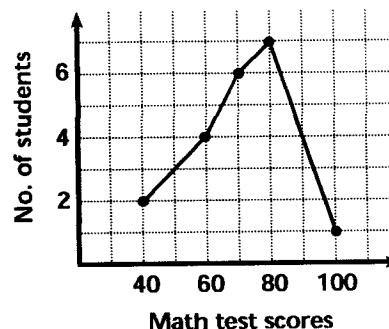
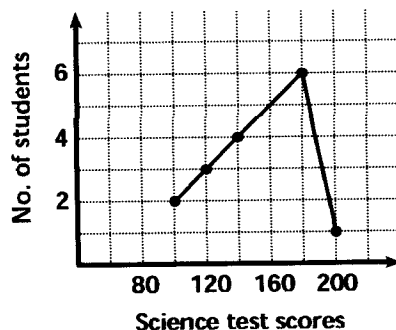
- How might displaying the graphs together be misleading?
- In what year were the sales of store A the highest?
- Which store has the highest sales in one year, and how much were they?



◆ Solution

- The graphs look like they use the same scale, but the graph of store B has a much higher scale, starting at \$100,000 and increasing in increments of \$50,000. Store B, therefore, had much higher sales.
- The highest point on the graph of store A is for 1995, when the store sold \$160,000 worth of merchandise.
- Store B sold \$300,000 worth of merchandise in 1995.

Use the test score graphs to answer the questions below.



- How might showing both graphs together be misleading?

2. What was the highest score on the science test, and how many students

got that score? _____

3. What was the most frequent score on the math test? _____

4. What was the most frequent score on the science test? _____

◆ Skill B Interpreting circle graphs

Recall Circle graphs are divided into parts to show data as percents of a whole.

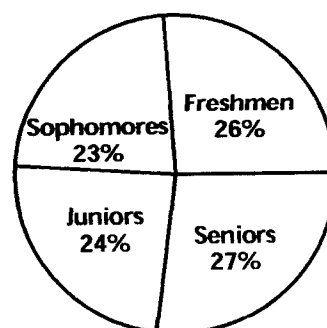
◆ Example

The graph shows the percent of students in each high-school class.

- If there are 2580 students, how many of them are seniors?
- Which class has 619 students?
- Which class has the least number of students?

◆ Solution

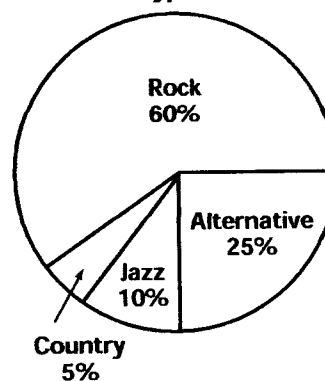
- 27% of the class are seniors.
 $0.27 \times 2580 = 697$
 There are 697 seniors.
- $\frac{619}{2580} \approx 0.24 = 24\%$, which is the percentage for the junior class
- The sophomore class has the least number of students.
 $23\% < 24\% < 26\% < 27\%$

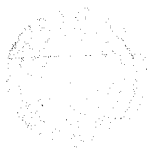


Use the circle graph shown to answer the following questions.

- If 300 people were interviewed, how many people said that rock music was their favorite? _____
- If 600 people were interviewed, how many chose alternative music as their favorite? _____
- If 260 people were interviewed, how many chose country as their favorite type of music? _____
- According to this graph, what is the most popular type of music? _____

Favorite Types of Music





Reteaching

4.4 Measures of Central Tendency

◆ Skill A Finding the measures of central tendency and the range

Recall The **mean** of a set of n numbers is the sum of all of the numbers divided by n .
 The **median** is the middle number of a group of numbers in ascending order.
 The **mode** is the most frequently occurring number in a group of numbers.
 A group of numbers may have more than one mode.
 The **range** is the difference between the highest number and the lowest number.

◆ Example

Find the mean, median, mode, and range of the following numbers:

80, 95, 82, 79, 79, 70, 80, 80

◆ Solution

The mean is the sum of all of the numbers divided by the number of values:

$$\frac{(80 + 95 + 82 + 79 + 79 + 70 + 80 + 80)}{8} = \frac{645}{8} = 80.6.$$

To find the median, write the numbers in ascending order: 70, 79, 79, 80, 80, 80, 82, and 95. There are an even number of data, so the median is the average of the two middle numbers: $\frac{(80 + 80)}{2} = 80$.

The mode is the most frequently occurring number, 80.

The range is the difference between the highest number, 95, and the lowest number, 70: $95 - 70 = 25$.

Find the mean, median, mode, and range for each set of data.

1. The daily sales of a convenience store in a week:
\$834, \$1099, \$765, \$900, \$900, \$950

mean _____ median _____ mode _____ range _____

2. ACT scores of 8 students: 18, 30, 22, 20, 28, 20, 22, 22

mean _____ median _____ mode _____ range _____

3. Number of points scored in 8 football games: 0, 14, 3, 14, 20, 21, 28, 10

mean _____ median _____ mode _____ range _____

4. Gallons of gas put into a car per week for the past 7 weeks:
11, 10, 8, 7, 10, 5, 5

mean _____ median _____ mode _____ range _____

◆ Skill B Making frequency tables

Recall A frequency table has two rows, one for the data values and one for the frequency of each data value.

◆ Example

Use the given data to create a frequency table and to answer the questions below.

Cars sold per day: 0, 8, 5, 2, 8, 9, 3, 3, 2, 9, 7, 0, 4, 2, 4, 6, 2, 9

- Find the mean.
- Find the median.
- Find the mode.

◆ Solution

Numbers	0	2	3	4	5	6	7	8	9
Frequency									

- Use the frequency table to add all the numbers. Then divide the total by 18.

$$\frac{83}{18} \approx 4.61 \quad \text{The mean is approximately 4.61.}$$

- Reorder the numbers in ascending order. There are an even number of data, so find the average of the two middle terms.

$$\frac{(4 + 4)}{2} = 4 \quad \text{The median is 4.}$$

- The most frequently occurring number is 2, so the mode is 2.

Create a frequency table for each set of data. Then find the mean, median, mode, and range of the data.

5.

Scores	
Frequency	

Test Scores		
89	75	80
89	75	70
95	100	70
89	91	95
75	75	80

mean _____ median _____ mode _____ range _____

6.

Accidents by Month											
Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
3	6	1	0	2	6	2	3	3	4	1	2

Accidents	
Frequency	

mean _____ median _____ mode _____ range _____



Reteaching

4.6 Other Data Displays

◆ Skill A Creating stem-and-leaf plots

Recall To make a stem-and-leaf plot, examine the data to decide what the stems will be. Then fill in the leaves in order from smallest to largest.

◆ Example

Use the data to make a stem-and-leaf plot.

Class size: 15, 14, 15, 18, 20, 22, 20, 24, 25, 20, 32, 31, 30, 34, 35

- What is the range of the data?
- What is the mean of the data?
- What is the mode of the data?

◆ Solution

The stems will be 1, 2, and 3; fill in the leaves in order.

Stems	Leaves
1	4 5 5 8
2	0 0 0 2 4 5
3	0 1 2 4 5

- range = $35 - 14 = 21$
- mean = $\frac{355}{15} = 23.7$
- mode = 20

Use the given data to make a stem-and-leaf plot and to answer each question.

Test Scores			
70	65	72	70
80	82	86	80
80	86	90	92
95	90	95	94

Stems	Leaves

- What is the range of the data? _____
- What is the median of the data? _____
- What is the mean of the data? _____
- What is the mode of the data? _____

Skill B Creating box-and-whisker plots

Recall A box-and-whisker plot uses the least value, the greatest value, the median, and the upper and lower quartiles of the data.
The upper quartile is the median of all the numbers in the upper half of the data.
The lower quartile is the median of all the numbers in the lower half of the data.

Example

Use the stem-and-leaf plot from Exercises 1–4 to make a box-and-whisker plot.

Solution

Draw a number line and mark the least value, 65, the greatest value, 95, and the median, 84.

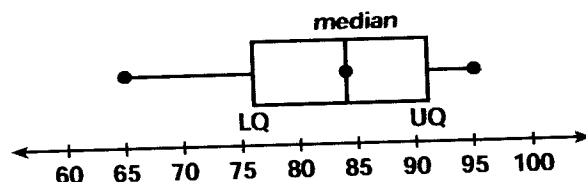
The lower quartile is the median of all the numbers below 84.

$$\frac{(72 + 80)}{2} = 76$$

The upper quartile is the median of the numbers above 84.

$$\frac{(90 + 92)}{2} = 91$$

Show the data on the graph and draw in the boxes, as shown.



Create box-and-whisker plots for each set of data.
Show your work.

5. least value _____
greatest value _____
median _____
lower quartile _____
upper quartile _____

Rainy Days per Month		
0	1	1
3	5	8
7	8	8
9	10	7
8	6	

6. Test scores for the class: 98, 76, 83, 85, 88, 94, 78, 93, 86, 86

- least value _____
greatest value _____
median _____
lower quartile _____
upper quartile _____



Reteaching

4.3 Introduction to Probability

◆ Skill A Finding experimental probability

Recall Suppose that t is the number of trials in an experiment and s is the number of times that a successful outcome occurs. The experimental probability, P , of a successful outcome is given by the following ratio:

$$P = \frac{\text{number of successes}}{\text{total number of trials}} = \frac{s}{t}$$

◆ Example 1

Two number cubes are rolled at the same time. During 300 rolls, the sum of 4 appears 60 times. Find the experimental probability that a sum of 4 occurs during 300 rolls.

◆ Solution

The number of trials is 300. The number of times that a successful outcome occurs is 60. Thus, the experimental probability that a sum of 4 occurs is

$$\frac{60}{300} = \frac{1}{5}, \text{ or } 20\%.$$

◆ Example 2

Tanner selected a chip from a jar containing red, blue, and green chips. Each time that he selected a chip, he recorded the color and returned the chip to the jar. He selected chips 80 times and recorded 20 red chips, 35 blue chips, and 25 green chips. What is the experimental probability of selecting a red chip OR a blue chip?

◆ Solution

The total number of trials is 80.

The number of successful red chip OR blue chip outcomes is $20 + 35$ or 55.

Thus, the experimental probability of selecting a red chip OR a blue chip is as follows:

$$\frac{20 + 35}{80} = \frac{55}{80} = \frac{11}{16}$$

The experimental probability is $\frac{11}{16}$, or about 69%.

Rhonda has a bag containing red, green, yellow, and blue marbles. She draws a marble from the bag and replaces it before drawing another. She has drawn 25 marbles and recorded 6 red, 8 green, 5 white, 4 yellow, and 2 blue marbles.

Find the experimental probability of each outcome.

1. She picked a red marble. _____
2. She picked a green marble. _____
3. She picked a yellow marble. _____
4. She picked a blue marble. _____
5. She picked a green marble OR a blue marble. _____
6. She did not pick a white marble. _____

The table shows Ray's results when he tosses a coin 80 times.

Outcome	Frequency	Total
heads		45
tails		35
		80

Use the results from the table above to find the experimental probability of each outcome.

7. The coin shows heads. _____ 8. The coin shows tails. _____

The number of bagels sold by the Bagel Shop in an hour is recorded in the following table:

Plain	Egg	Onion	Blueberry	Sesame	Cinnamon
24	14	12	10	8	7

Use the data from the table above to find the experimental probability of each outcome.

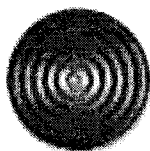
9. A plain bagel is sold. _____ 10. A sesame bagel is sold. _____
 11. An onion bagel is sold. _____ 12. A cinnamon bagel is sold. _____
 13. A blueberry OR sesame bagel is sold. _____
 14. An onion OR an egg bagel is sold. _____

Two coins are flipped at the same time for 10 tosses. The results are shown in the table.

Trial	1	2	3	4	5	6	7	8	9	10
Coin 1	H	T	H	H	T	H	T	H	H	T
Coin 2	H	H	T	H	T	T	H	T	H	H

Use the data from the table above to find the experimental probability of each outcome.

15. Both coins show the same side. _____ 16. Both coins show different sides. _____
 17. Both coins show heads. _____ 18. Both coins show tails. _____
 19. Coin 1 shows heads. _____ 20. Coin 1 shows tails. _____
 21. Coin 2 shows heads. _____ 22. Coin 2 shows tails. _____



Reteaching

13.1 Theoretical Probability

◆ Skill A Listing favorable outcomes

Recall The set of all possible outcomes of a probability experiment is called the sample space of the experiment.

◆ Example 1

What is the sample space when a coin is tossed three times?

◆ Solution

There are eight different possible outcomes.

First Toss	Second Toss	Third Toss
H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

The sample space is HHH, HHT, HTH, HTT, THH, THT, TTH, TTT.

Recall The favorable outcomes are the outcomes that you are looking for in the probability experiment.

◆ Example 2

What are the favorable outcomes if you want exactly two heads to appear?

◆ Solution

The favorable outcomes are HHT and THH.

A coin is tossed, and a number cube is rolled.

- List the sample space. _____
- What are the favorable outcomes if you want a head OR a 2 to appear? _____
- What are the favorable outcomes if you want a head AND a 4 to appear? _____
- What are the favorable outcomes if you want a tail OR an even number to appear? _____
- What are the favorable outcomes if you want a tail AND an even number to appear? _____

◆ Skill B Finding the probability that an event will occur

Recall The theoretical probability, P , that an event will occur is defined as $P = \frac{f}{n}$, where f is the number of favorable outcomes and n is the total number of equally likely outcomes.

◆ Example

Find the probability that in one roll of a 12-sided number cube (dodecahedron) a prime number will result.

◆ Solution

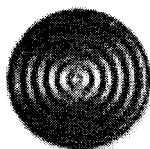
Each of the 12 faces is equally likely to land face up on any one roll. Because 2, 3, 5, 7, and 11 are the prime numbers between 1 and 12, there are 5 ways for a successful outcome to occur.

$$P = \frac{\text{number of favorable outcomes}}{\text{total number of outcomes}} = \frac{f}{n} = \frac{5}{12}$$

The probability of rolling a prime number is $\frac{5}{12}$.

Find each probability.

6. From a bag containing 12 marbles, one is drawn at random. If the bag contains 2 yellow, 3 green, 4 blue, and 3 red marbles, find the probability of drawing a green marble. _____
7. If a letter is selected at random from the word *probability*, find the probability that the letter is a consonant. _____
8. If a letter is selected at random from all the letters in this sentence, find the probability that the letter selected is a *t*. _____



Reteaching

13.2 Counting the Elements of Sets

◆ Skill A Drawing and using Venn diagrams

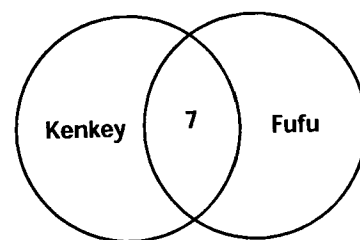
Recall In a Venn diagram, overlapping regions represent the intersection of two sets, or the word AND. Combined regions represent the union of two sets, or the word OR. The area outside a region represents the word NOT.

◆ Example

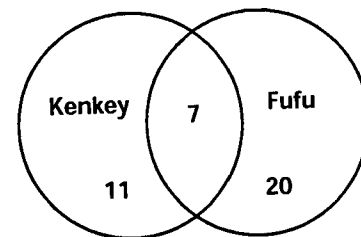
In a small Ghanaian village, there are 38 children with ages ranging from 6 to 12 years old. Eighteen of the children eat kenkey and 27 eat fufu. This includes 7 children who eat both. Use a Venn diagram to determine how many children eat only fufu.

◆ Solution

Because some children eat both foods, draw two circles that overlap. In the overlap, place the number that represents the number of children who eat both foods.



The total number of children who eat kenkey must be 18, and 7 of the children that eat kenkey are already represented, so place an additional 11 in the other part of the kenkey circle. The total number of children who eat fufu is 27. Because 7 that eat fufu are already represented, an additional 20 must be placed within the other part of the fufu circle. Thus, there are 20 children who eat only fufu.



Represent each situation with a Venn diagram.

1. Fifteen children at a birthday party are taken to an ice-cream parlor. Seven order chocolate, and 12 order vanilla. This includes 4 who order a combination of chocolate and vanilla.
2. At a summer camp, 36 campers were asked whether they play golf or tennis. Fifteen said that they play golf, while 17 reported that they play tennis. This included 2 who play both and 6 who play neither.

◆ Skill B Counting elements of sets

Recall The total number of ways to choose A OR $B = (\text{number of ways to choose } A + \text{number of ways to choose } B) - (\text{number of ways to choose both } A \text{ AND } B).$

◆ Example

A survey of students' preferences for spring sports produced the following results:

	Baseball	Lacrosse	Total
Blue	14	16	30
Orange	12	19	31
Total	26	35	61

- How many students were in the orange group?
- How many students preferred baseball?
- How many students were in the orange group AND preferred baseball?
- How many students were in the orange group OR preferred baseball?

◆ Solution

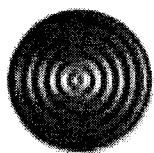
- The total for the second row, orange, is 31.
- The total for the first column, baseball, is 26.
- The intersection of the first column, baseball, and the second row, orange, is 12.
- Number of students who were in the orange group OR preferred baseball =

Number of students who were in orange group	31
+ Number of students who preferred baseball	<u>+ 26</u>
	57
- Number of students who were in orange group AND preferred baseball	<u>- 12</u>
	45 students

The Parents' Sports Club conducted a survey in order to determine whether to hold an auction or to run a raffle to raise funds. The table shows the results of the survey.

	Auction	raffle	Total
Men	44	91	135
Women	116	35	151
Total	160	126	286

- How many parents surveyed were men? _____
- How many parents preferred a raffle? _____
- How many parents surveyed were men AND preferred a raffle? _____
- How many parents surveyed were men OR preferred a raffle? _____



Reteaching

13.3 The Fundamental Counting Principle

◆ Skill A Drawing and using tree diagrams

Recall Each branch of a tree diagram represents a possible outcome. The number of branches at each endpoint depends on the number of ways in which an event can happen. Together, all of the branches represent all of the possible outcomes of an event.

◆ Example

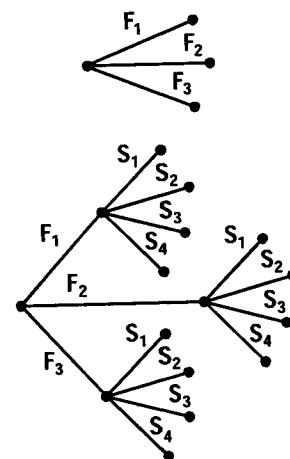
Three flavors of ice cream, four sauces, and two toppings, either cherries or chocolate sprinkles, are available for making sundaes. Use a tree diagram to determine how many different sundaes can be made with one flavor of ice cream, one sauce, and one topping.

◆ Solution

Start with one point and make three branches to represent the three flavors of ice cream.

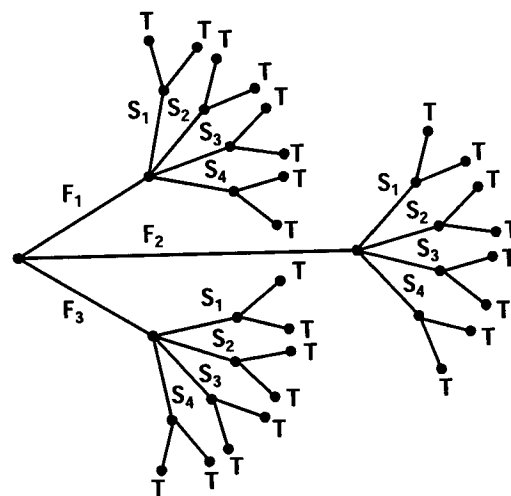
From each point at the end of these three branches, make four branches to represent the four sauces.

From each point at the end of the 12 branches, make two branches to represent the two toppings.



Count the number of paths in the tree. There are 24 different sundaes that can be made with the given ingredients.

An alternative is to count the points at the ends of the paths.



Use a tree diagram to answer each question.

- When packing for a business trip, Mr. Simmons selects 3 suits, 4 shirts, and 5 ties. How many different outfits (1 suit, 1 shirt, 1 tie) can he put together?

2. The science class decided to present a pet display for the kindergarteners. Two students volunteered to bring fish; 3 could bring cats; 3 wanted to bring dogs, and 2 said that they could bring rabbits. If the display could include one pet from each category, how many displays were possible? _____

◆ **Skill B** Using the Fundamental Counting Principle

Recall The total number of ways to choose A AND B AND C = number of ways to choose A · number of ways to choose B · number of ways to choose C .

◆ **Example**

When Marianne got a new job, she bought 5 blouses, 4 skirts, and 3 pairs of shoes. How many days could Marianne go to work without wearing the same outfit (1 blouse, 1 skirt, 1 pair of shoes)?

◆ **Solution**

To put an outfit together, there are 5 tops to choose from. Once a top is chosen, there are 4 skirts to choose from. Once a top and skirt are chosen, there are 3 pairs of shoes to choose from.

Number of outfits =
number of ways to choose a top · number of ways to choose a skirt · number of ways to choose a pair of shoes $5 \cdot 4 \cdot 3 = 60$ outfits

Use the Fundamental Counting Principle to solve each of the following:

3. If the new license plate pattern in the 51st state is any letter, followed by any digit, followed by any letter, how many distinct license plates can be made? _____
4. The house numbers in a new development are to be 3-digit numbers ranging from 700 to 899 and the last digit must be even. How many possible house numbers will there be? _____
5. Two cards are drawn from a regular deck of 52 playing cards one at a time without replacement. How many ways are there to draw 2 kings? _____